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Bundle-branch reentry ventricular tachycardia after transcatheter aortic valve replacement

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ARTICLE INFO

Article history:
Available online 12 February 2016

ABSTRACT

An 83-year-old male suffering from severe symptomatic aortic valve stenosis received an implant of a biological aortic prosthesis through the femoral artery without complications. Seven days after dischargement he experienced a syncope. The patient was wearing an ECG holter monitor that day, which showed a wide QRS complex tachycardia of 300 beats per minute. The electrophysiological study revealed a bundle-branch reentry ventricular tachycardia as the cause of the syncope. Radio-frequency was applied on the right-bundle branch. Twelve months later, the patient has remained asymptomatic.

Case report text

An 83-year-old male suffering from severe symptomatic aortic valve stenosis and, being a high surgical risk, received an implant of a biological aortic prosthesis (Corevalve 29) through the femoral artery. During the evaluation prior to the implant, the electrocardiogram (ECG) (Fig. 1A) showed sinus rhythm with an incomplete right-bundle branch block and left anterior hemiblock. The echocardiogram showed signs of calcifications in the aortic valve with a peak gradient of 90 mmHg and a medium gradient of 60 mmHg. The left ventricle showed good global and segmental contraction and the coronography showed insignificant irregular coronary vessels.

During the expansion process of the prosthetic valve in the aortic root, we observed a previously unregistered complete heart block, which lasted for 2–3 min. The ECG (Fig. 1B) showed how atrioventricular conduction immediately restarted after the complete block, with a slight widening of the QRS. The patient was hospitalized and monitored for seven days, without presenting any further heart block or arrhythmia.

Five days after being discharged, the patient suffered from syncope in a park. When arriving at the Emergency Room, the vital signs were normal and the ECG was similar to the one taken at the time of discharge. An echocardiogram showed that the prosthesis was functioning correctly with a regular ventricular function. Fortunately, the patient was wearing an ECG holter monitor that day, which revealed a wide QRS complex tachycardia of 300 beats per minute (bpm) lasting 43 min (Fig. 1C).

An electrophysiological study was performed, which revealed an HV interval of 64 ms. We induced, through ventricular stimulation, a 300 bpm ventricular tachycardia (Fig. 2A) with a left-bundled branch block and left axis, with

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Peer review under responsibility of Indian Heart Rhythm Society.
http://dx.doi.org/10.1016/j.ipej.2016.02.004

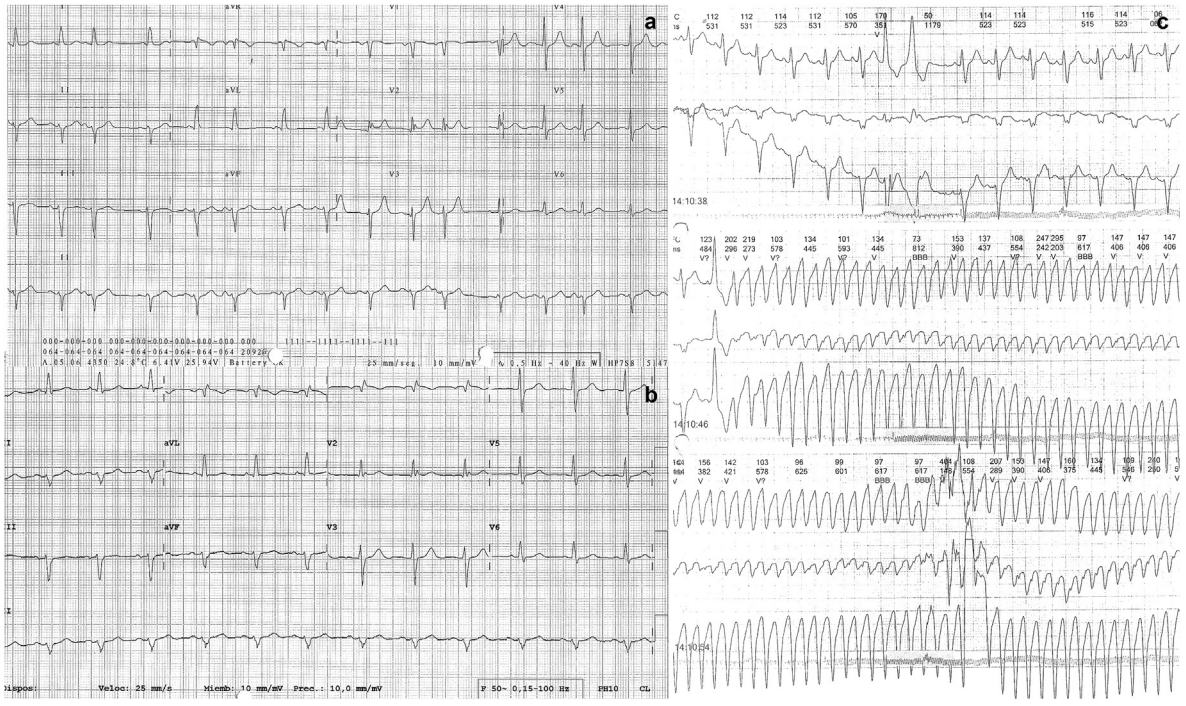

Fig. 1 – A. ECG at initial evaluation showed sinus rhythm with an incomplete right-bundle branch block and left anterior hemiblock. B: after Corevalve 29 implantation the ECG showed a slight widening of the QRS. C: Ventricular tachycardia at 300 bpm.

similar morphology to the syncope-registered ECG. We were unable to register the His during the tachycardia. The post pacing interval after entrainment by right ventricular apex stimulation was +20 ms (Fig. 2B). The conclusion was that the cause of the syncope was due to a bundle-branch reentry. Radio-frequency was applied on the right-bundle branch, with a QRS widening from 130 ms to 150 ms (Fig. 2C). It was afterwards not possible to induce the tachycardia. The HV interval after the ablation was of 67 ms, and the Wenckebach AV point was 180 bpm. Twelve months later, the patient has remained asymptomatic.

Atrioventricular conduction impairments are common after trans-catheter implant of an aortic valve. The insertion of metallic materials close to the prosthetic overlays, in particular within the first millimeters of the interventricular septum under the aortic root, can harm the conduction system. Approximately 45% of the patients with a Corevalve prosthesis develop signs of a left-bundle branch block. Only 5–10% of the patients develop a right-bundle branch block, as seen in our patient. Lastly, approximately 25–30% of the patients with a Core valve prosthesis need a pacemaker implantation [1].

Furthermore, it is also known that aortic valve diseases, valve surgery [2] and conduction impairments may cause bundle-branch reentry tachycardia.

Bundle-branch reentry tachycardia is a macroreentrant tachycardia that uses the right and left branches as reentry components in its circuit. It accounts for 6–8% of all induced tachycardias. In patients with non-ischemic dilated myocardiopathies, bundle-branch reentry tachycardia may amount to 40% of the induced ventricular tachycardias [3]. It can also be detected in patients with previous myocardial infarction and myotonic dystrophy. It has also been noted that aortic valve surgery may trigger bundle-branch reentry tachycardia [4].

After surgery, ventricular tachycardia has a bimodal temporal pattern [2]. Bundle-branch reentry tachycardia may be seen at an early stage, normally four weeks after surgery and the ventricular function tends to be regular. Ventricular tachycardias that set at a later stage are usually related to periannular scars or underlying myocardiopathies.

As far as we are aware, this is the first case of a bundle-branch reentry tachycardia after trans-catheter implantation of a prosthetic aortic valve. If our patient had not been wearing the ECG holter at the time of the syncope, we would have not been able to register the tachycardia and would have implanted a pacemaker. Especially, taking into account the paroxysmal complete block that the patient experienced during the implant of the valve and the widening of the QRS.

With regard to the electrophysiological study, we wish to outline the utility of the return cycle for the diagnosis of the bundle-branch reentry tachycardia in patients with difficulties at the His registry [5]. We believe that the implantation of a pacemaker is not required at the onset of syncope in patients who have undergone a trans-catheter implantation of an aortic valve, and developed a bundle-branch block. In these cases, an electrophysiological study is suggested in order to exclude the presence of a bundle-branch reentry tachycardia.

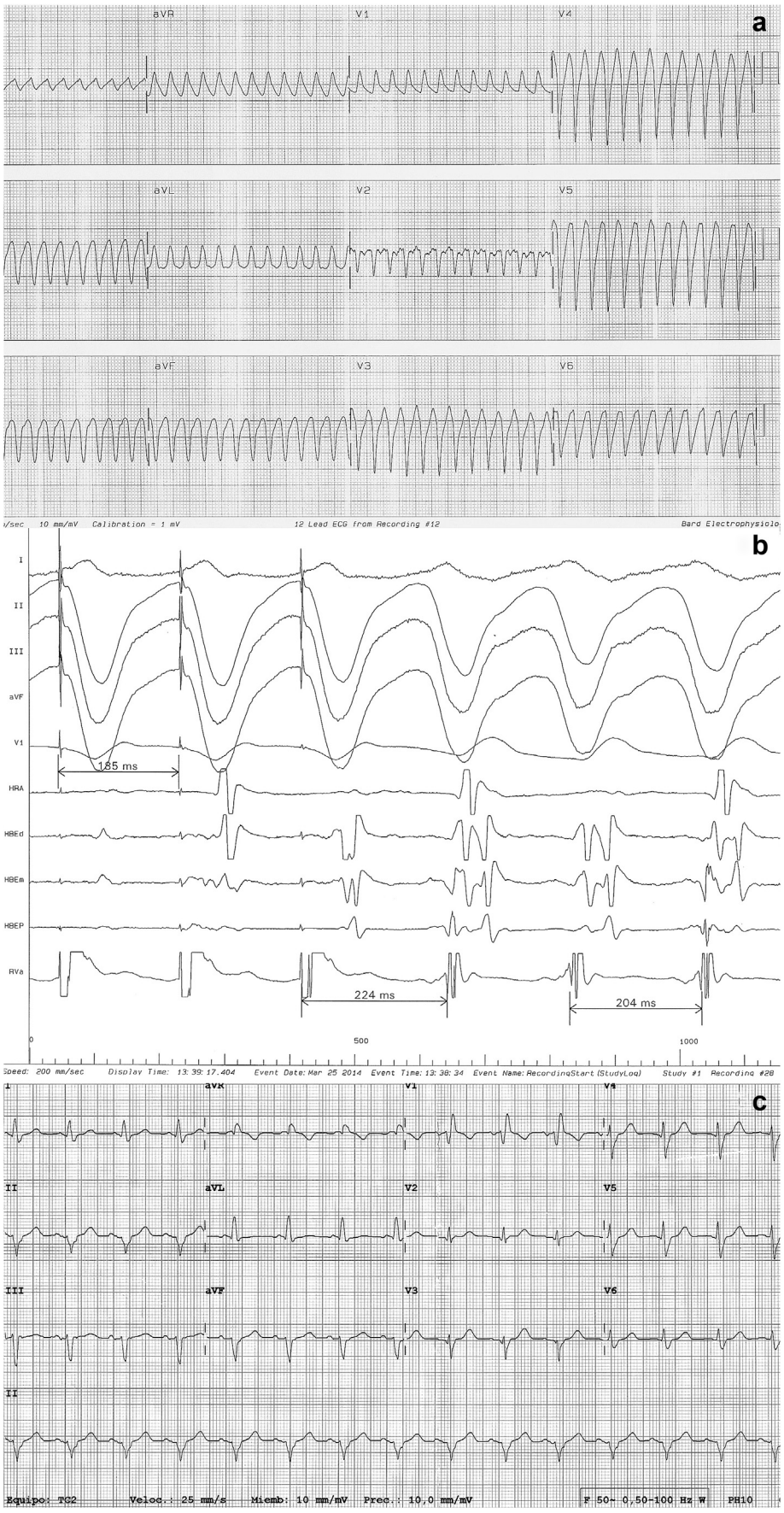

Fig. 2 – A. ECG during the electrophysiological study: 300 bpm ventricular tachycardia with a left-bundled branch block. B: intracardiac recordings from high right atrium (HRA), His bundle area and right ventricle apex (RVA). Pacing from RVA in VT. The post pacing interval was +20 ms. C ECG after radio-frequency was applied on the right-bundle. Branch.

Conflict of interest

None of the authors declare a conflict of interest.

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